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EXAMINER	
YOUNG, NATASHA E	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/805,871	KIM ET AL.
	Examiner	Art Unit
	Natasha Young	1797

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *06/16/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

The abstract of the disclosure is objected to because the abstract should be one paragraph in length. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The examiner is unsure of whether the smart pipette or the micro manipulation device is the claimed invention.

Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: The structural relationship between a vision, unit, a haptic unit, a control unit, a graphic user interface, and a holding pipette is not disclosed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-2, 5-9, 11, and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoigawa et al (JP 11-347971) in view of Henderson et al (US 6,251,658 B1) and Fung et al (Internet-Based Remote Sensing and Manipulation in Micro Environment, 2001).

Regarding claim 1, Itoigawa et al teaches a smart pipette for bio-cell manipulation which is part of a micromanipulation device with a sensor unit that obtains

force/torque information concerning the bio-cell and the smart pipette at the time of the bio-cell manipulation (see Abstract, paragraphs 0031-0032; and drawing 1).

Itoigawa et al does not teach smart pipette for bio-cell manipulation, which, together with a vision unit, a haptic unit, a control unit, a graphic user interface and a holding pipette, constitutes a micro manipulation device, comprising: an orientation adjusting unit that changes orientation of a bio-cell whose location has been fixed by the holding pipette; and a sensor unit that obtains force/torque information concerning the bio-cell and the smart pipette at the time of the bio-cell manipulation.

Henderson et al teaches an injection micropipette (42), a cell (41), and a holding pipette (40) (see Abstract; figure 4; and column 6, lines 44-65) and the micropipette (11) is attached to the drill (20) which is mounted on the micromanipulator (21) and held in place by clamp (22) by mounting rod (13) with manual controls (23, 24, 25, 26, 27) to allow accurate pre-positioning of the tip of the micropipette (see figure 2 and column 6, lines 9-18).

Although Henderson et al does not disclose changing the orientation of a bio-cell, since the tip of the micropipette may be pre-positioned the manipulator is capable of changing the orientation of the bio-cell.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Henderson for a wider range of positioning of the micropipette.

Fung et al discloses the use of a vision unit (traditional video), haptic unit (haptic or force information and the computer that receives this information and sends it to the

internet which acts as a communication medium), control unit (computer and the internet) in micromanipulation (see section 1 and figure 2). The internet uses a graphic user interface to obtain the visual and haptic data and to make adjustments accordingly.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Itoigawa et al and Henderson et al with the teachings of Fung et al to increase efficiency and safety of manipulation at microscopic levels (see Fung et al Section 3B, 4^{th} paragraph).

Claims 2 and 5-10 depend on claim 1 such that the reasoning use to reject claim 1 will be used to reject the dependent portions of the claims.

Regarding claim 2, Itoigawa et al does not teach a small pipette wherein the orientation adjusting unit has same degree of freedom as the micro manipulation device and may change the orientation of the bio-cell.

Henderson et al teaches an injection micropipette (42), a cell (41), and a holding pipette (40) (see Abstract; figure 4; and column 6, lines 44-65) and the micropipette (11) is attached to the drill (20) which is mounted on the micromanipulator (21) and held in place by clamp (22) by mounting rod (13) with manual controls (23, 24, 25, 26, 27) to allow accurate pre-positioning of the tip of the micropipette (see figure 2 and column 6, lines 9-18).

Although Henderson et al does not disclose changing the orientation of a bio-cell, since the tip of the micropipette may be pre-positioned the manipulator is capable of changing the orientation of the bio-cell. The orientation of the bio-cell depends on the micromanipulator such that the number of ways the micromanipulator may approach the

bio-cell such that a change in orientation of the bio-cell occurs, which results in the orientation adjusting unit has same degree of freedom as the micro manipulation device and may change the orientation of the bio-cell.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Henderson for a wider range of positioning of the micropipette.

Regarding claim 5, Itoigawa et al teaches a smart pipette wherein the orientation adjusting unit is located apart from a tip of the pipette at least by certain length that would make it not interfere with penetration into the bio-cell (see Abstract and drawing 1)

Regarding claim 6, Itoigawa et al does not teach a smart pipette wherein the orientation adjusting unit changes orientation of the bio-cell by using friction with the bio-cell.

Henderson et al teaches an injection micropipette (42), a cell (41), and a holding pipette (40) (see Abstract; figure 4; and column 6, lines 44-65) and the micropipette (11) is attached to the drill (20) which is mounted on the micromanipulator (21) and held in place by clamp (22) by mounting rod (13) with manual controls (23, 24, 25, 26, 27) to allow accurate pre-positioning of the tip of the micropipette (see figure 2 and column 6, lines 9-18).

Although Henderson et al does not disclose changing the orientation of a bio-cell, since the tip of the micropipette may be pre-positioned the manipulator is capable of

changing the orientation of the bio-cell and of how the micropipette interacts with the cell changing the orientation of the bio-cell would be by friction with the bio-cell.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Henderson for a wider range of positioning of the micropipette.

Regarding claim 7, Itoigawa et al does not teach a smart pipette wherein the orientation adjusting unit changes orientation of the bio-cell when the holding pipette's force that holds the bio-cell has been weakened.

Henderson et al teaches an injection micropipette (42), a cell (41), and a holding pipette (40) (see Abstract; figure 4; and column 6, lines 44-65) and the micropipette (11) is attached to the drill (20) which is mounted on the micromanipulator (21) and held in place by clamp (22) by mounting rod (13) with manual controls (23, 24, 25, 26, 27) to allow accurate pre-positioning of the tip of the micropipette (see figure 2 and column 6, lines 9-18).

Although Henderson et al does not disclose changing the orientation of a bio-cell, since the tip of the micropipette may be pre-positioned the manipulator is capable of changing the orientation of the bio-cell and as a result of this change in orientation the forces that hold the bio-cell would be weakened.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Henderson for a wider range of positioning of the micropipette.

Regarding claim 8, Itoigawa et al does not teach a smart pipette wherein the sensor unit transmits the force/torque information real time to the haptic unit.

Fung et al teaches the use of haptic or force information and a computer that receives this information and sends it to the internet which acts as a communication medium (see section 1). The sensor unit transmits the force/torque information with a time delay since the testing is done between Hong Kong and Michigan State and since the system performance is stable (see section 3B, 3rd paragraph) and the delay is due to the use of time as the reference variable such that if a non-time based reference variable is used the system would become immune to delay (see section 4, 1st paragraph) real time transmitting of the force-torque information to the haptic unit is possible.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Itoigawa et al and Henderson et al to increase efficiency and safety of manipulation at microscopic levels (see Fung et al Section 3B, 4th paragraph).

Regarding claim 9, Itoigawa et al does not teach a smart pipette wherein sensor unit is a piezo-electric polymer sensor.

Fung et al teaches a sensor unit that is a piezo-electric polymer sensor (see section 3rd paragraph).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Fung

et al because the piezo-electric polymers are laser-micromachinable and able to provide force-rate-sensing at micro scale (see section 1, 3rd paragraph).

Claim 11 depends on claim 2 such that the reasoning used to reject claim 2 will be used to reject the dependent portions of the claim.

Regarding claim 11, Itoigawa et al does not teach a smart pipette wherein orientation adjusting unit changes orientation of the bio-cell to directions of x, y or z axes.

Henderson et al teaches an injection micropipette (42), a cell (41), and a holding pipette (40) (see Abstract; figure 4; and column 6, lines 44-65) and the micropipette (11) is attached to the drill (20) which is mounted on the micromanipulator (21) and held in place by clamp (22) by mounting rod (13) with manual controls (23, 24, 25, 26, 27) to allow accurate pre-positioning of the tip of the micropipette (see figure 2 and column 6, lines 9-18).

Although Henderson et al does not disclose changing the orientation of a bio-cell to directions of x, y, and z, because manual adjustments of controls (23, 24, 25, 26, 27) would allow the micropipette to approach the bio-cell along the x, y, and z axes.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Henderson for a wider range of positioning of the micropipette.

Claim 13 depends on claim 8 such that the reasoning used to reject claim 8 will be used to reject the dependent portions of the claim.

Regarding claim 13, Itoigawa et al does not teach a smart pipette wherein the force/torque information transmitted by the sensor unit is quantified and transmitted to the manipulating person real time through the graphic user interface.

Fung et al discloses the use of a vision unit (traditional video), haptic unit (haptic or force information and the computer that receives this information and sends it to the internet which acts as a communication medium), control unit (computer and the internet) in micromanipulation (see section 1 and figure 2). The internet uses a graphic user interface to obtain the visual and haptic data and to make adjustments accordingly.

Fung et al teaches the use of haptic or force information and a computer that receives this information and sends it to the internet which acts as a communication medium (see section 1). The sensor unit transmits the force/torque information with a time delay since the testing is done between Hong Kong and Michigan State and since the system performance is stable (see section 3B, 3rd paragraph) and the delay is due to the use of time as the reference variable such that if a non-time based reference variable is used the system would become immune to delay (see section 4, 1st paragraph) real time transmitting of the force-torque information to the haptic unit is possible.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Itoigawa et al and Henderson et al to increase efficiency and safety of manipulation at microscopic levels (see Fung et al Section 3B, 4th paragraph).

Claim 14 depends on claim 9 such that the reasoning used to reject claim 9 will be used to reject the dependent portions of the claim.

Regarding claim 14, Itoigawa et al does not teach a smart pipette wherein the piezo-electric polymer is polyvinylidene fluoride (PVDF) film.

Fung et al teaches a piezo-electric polymer is made of polyvinylidene fluoride (PVDF) (see section 3rd paragraph), but Fung et al is silent to the form/shape of the polymer.

Because the polymer is easy to handle and shape (see section2, 2nd paragraph) it would have been obvious to one having ordinary skill in the art at the time the invention was made to shape the polymer into a film to be applied to micro-tip as force-rate sensors (see section 2, 3rd paragraph).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Fung et al because the polyvinylidene fluoride (PVDF) film are laser-micromachinable and able to provide force-rate-sensing at micro scale (see section 1, 3rd paragraph).

Claim 15 depends on claim 1 such that the reasoning used to reject claim 1 will be used to reject the dependent portions of the claim.

Regarding claim 15, Itoigawa et al does not teach a smart pipette further comprising a minute driver for minute manipulation of the smart pipette.

Henderson et al teaches an improved inertial impact drill having an electromechanical actuator driven by pulses from a driver/amplifier in which the repetition rate, amplitude, and duration of the pulses can be controlled by the operator

via the driver/amplifier (see column 4, lines 58-65) such that it would be an obvious variation to set the driver for minute manipulation.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Henderson to allow the operator to optimize the efficiency of the penetration while minimizing damage to the object being penetrated by the drill (see Henderson et al column 4, line 58-65).

Claim 16 depends on claim 15 such that the reasoning used to reject claim 15 will be used to reject the dependent portions of the claim.

Regarding claim 16, Itoigawa et al does not teach a smart pipette wherein the minute driver conducts impact driving using the graphic user interface.

Henderson et al teaches the driver conducts impact driving (driving the actuators) (see column 5, line 66 through column 6, line 45).

Henderson et al does not teach a graphic user interface.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Henderson to allow the operator to optimize the efficiency of the penetration while minimizing damage to the object being penetrated by the drill (see Henderson et al column 4, line 58-65).

Fung et al discloses the use of a vision unit (traditional video), haptic unit (haptic or force information and the computer that receives this information and sends it to the internet which acts as a communication medium), control unit (computer and the

internet) in micromanipulation (see section 1 and figure 2). The internet uses a graphic user interface to obtain the visual and haptic data and to make adjustments accordingly.

It would have been obvious to one having ordinary skill in the art at the time the invention was mad e to modify the combined teachings of Itoigawa et al and Henderson et al to increase efficiency and safety of manipulation at microscopic levels (see Fung et al Section 3B, 4th paragraph).

Claims 17-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fung et al (Internet-Based Remote Sensing and Manipulation in Micro Environment, 2001) in view of Henderson et al (US 6,251,658 B1).

Regarding claim 17, Fung et al teaches a method of –micro-manipulation using micro-tips comprising (a) quantifying force/torque information acquired through the sensor unit during bio-cell manipulation; (b) transmitting the quantified force/torque information to a graphic user interface; and (c) manipulating the micro-tip based upon the force/torque information transmitted in said step (b) (see section 4, part A). The internet uses a graphic user interface to obtain the visual and haptic data and to make adjustments accordingly.

Fung et al is silent to the use on a bio-cell of a smart pipette.

Henderson et al teaches the use of the tip of the micro-pipette (micro-tip) to inject into biological cells using micromanipulators (see column 1, lines 18-38).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Fung et al with the teachings of Henderson to use the methods in biological processes like cloning, in-vitro fertilization,

genetic research, and in developing methods for treating cancer and genetically caused diseases (see Henderson et al column 1, lines 18-28).

Claims 18-20 depend on claim 17 such that the reasoning used to reject claim 17 will be used to reject the dependent portions of the claims.

Regarding claim 18, Fung et al teaches a manipulation method wherein the force/torque information quantified in said step (a) is measured by a piezo-electric sensor and then quantified (see section 1, 3rd paragraph and section 4, part A).

Regarding claim 19, Fung et al does not teach a manipulation method wherein in said step (b), the force/torque information is transmitted real time.

However, Fung et al teaches the use of haptic or force information and a computer that receives this information and sends it to the internet which acts as a communication medium (see section 1). The sensor unit transmits the force/torque information with a time delay since the testing is done between Hong Kong and Michigan State and since the system performance is stable (see section 3B, 3rd paragraph) and the delay is due to the use of time as the reference variable such that if a non-time based reference variable is used the system would become immune to delay (see section 4, 1st paragraph) real time transmitting of the force-torque information to the haptic unit is possible.

Regarding claim 20, Fung et al is silent concerning a manipulation method wherein said step (c) comprises: (d) comparing the quantified force/torque information with data acquired through prior experiments; and (e) conducting the bio-cell manipulation based upon the comparison made in said step (d).

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Fung et al such that said step (c) comprises: (d) comparing the quantified force/torque information with data acquired through prior experiments; and (e) conducting the bio-cell manipulation based upon the comparison made in said step (d) since to use the internet a computer with memory is required such that quantified force/torque information is recorded or saved to the computer for later use by the operator to bio-cell manipulation.

Claim 21 depends on claim 20 such that the reasoning used to reject claim 20 will be used to reject the dependent portions of the claim.

Regarding claim 21, Fung et al does not teach a manipulation method wherein said step (e) is a step of acquiring information about in which layer of the bio-cell a tip of the smart pipette is located based upon the comparison made in said step (d).

However, Fung et al teaches that the sensor tips attached to an x-y-computer-controlled positioning table such that the location of the sensor tip is known (see section 4, part A).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Fung et al such that said step (e) is a step of acquiring information about in which layer of the bio-cell a tip of the smart pipette is located based upon the comparison made in said step (d), since to use the internet a computer with memory is required such that quantified force/torque information is recorded or saved to the computer for later use by the operator to bio-cell manipulation

Fung et al is silent to the use of a smart pipette.

Henderson et al teaches the use of the tip of the micro-pipette (micro-tip) to inject into biological cells using micromanipulators (see column 1, lines 18-38).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Fung et al with the teachings of Henderson to use the methods in biological processes like cloning, in-vitro fertilization, genetic research, and in developing methods for treating cancer and genetically caused diseases (see Henderson et al column 1, lines 18-28).

Regarding claim 22, Fung et al teaches a manipulation system using micro-tips comprising a sensory information receiver that acquires sensory information generated by the micro-tip; and a measuring unit that receives the force/torque information from the sensory information receiver (the micro-tip and the computer) (see section 4, part A).

Fung et al does not teach bio-cell manipulation system using a smart pipette comprising: a sensory information receiver that acquires sensory information generated between the smart pipette and the bio-cell during the minute manipulation using the smart pipette; and a measuring unit that receives the force/torque information from the sensory information receiver and quantifies such information.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Fung et al such that said step (c) comprises: (d) comparing the quantified force/torque information with data acquired through prior experiments; and (e) conducting the bio-cell manipulation based upon the comparison made in said step (d) since to use the internet a computer with memory is

required such that quantified force/torque information is recorded or saved to the computer for later use by the operator to bio-cell manipulation.

Henderson et al teaches the use of the tip of the micro-pipette (micro-tip) to inject into biological cells using micromanipulators (see column 1, lines 18-38).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Fung et al with the teachings of Henderson to use the methods in biological processes like cloning, in-vitro fertilization, genetic research, and in developing methods for treating cancer and genetically caused diseases (see Henderson et al column 1, lines 18-28).

Henderson et al teaches an improved inertial impact drill having an electromechanical actuator driven by pulses from a driver/amplifier in which the repetition rate, amplitude, and duration of the pulses can be controlled by the operator via the driver/amplifier (see column 4, lines 58-65) such that it would be an obvious variation to set the driver for minute manipulation.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Henderson to allow the operator to optimize the efficiency of the penetration while minimizing damage to the object being penetrated by the drill (see Henderson et al column 4, line 58-65).

Claims 23-26 depend on claim 22 such that the reasoning used to reject claim 22 will be used to reject the dependent portions of the claims.

Regarding claim 23, Fung et al teaches a manipulation system wherein the sensory information receiver comprises: a vision unit that acquires visual information of the micro-tip; and a haptic unit that acquires force/torque information between the smart pipette and the bio-cell (see section 4, part A).

Fung et al is silent concerning a bio-cell and smart pipette.

Henderson et al teaches the use of the tip of the micro-pipette (micro-tip) to inject into biological cells using micromanipulators (see column 1, lines 18-38).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Fung et al with the teachings of Henderson such that a vision unit that acquires visual information of the bio-cell and smart pipette for the addition of the internet-based remote sensing and manipulation system in biological processes like cloning, in-vitro fertilization, genetic research, and in developing methods for treating cancer and genetically caused diseases (see Henderson et al column 1, lines 18-28).

Regarding claim 24, Fung et al is silent concerning a manipulation system wherein the measuring unit displays the quantified force/torque information using a graphic user interface.

However, Fung et al discloses the use of a vision unit (traditional video), haptic unit (haptic or force information and the computer that receives this information and sends it to the internet which acts as a communication medium), control unit (computer and the internet) in micromanipulation (see section 1 and figure 2) such that it would have been obvious to display the quantified force/torque information on the computer

screen from the force sensor of the vibrating cantilever(see section 4, part A). The internet uses a graphic user interface to obtain the visual and haptic data and to make adjustments accordingly.

Regarding claim 25, Fung et al does not teach a manipulation system wherein the measuring unit expresses the force/torque information as voltage.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to display the tip vibration, which in measured in units of length, in unit of voltage, since there is a relationship between the vibration of the micro-tip and the power used to accomplish that task.

Regarding claim 26, Fung et al teaches controlling the micro-tip operation based on the force/torque information quantified (sent) at the measuring unit (the micro-tip and the computer).

Fung et al is silent concerning the smart pipette.

Henderson et al teaches the use of the tip of the micro-pipette (micro-tip) to inject into biological cells using micromanipulators (see column 1, lines 18-38).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Fung et al with the teachings of Henderson such that a vision unit that acquires visual information of the bio-cell and smart pipette for the addition of the internet-based remote sensing and manipulation system in biological processes like cloning, in-vitro fertilization, genetic research, and in developing methods for treating cancer and genetically caused diseases (see Henderson et al column 1, lines 18-28).

Claim 27 depends on claim 26 such that the reasoning used to reject claim 26 will be used to reject the dependent portions of the claim.

Regarding claim 27, Fung et al does not teach a manipulation system wherein the control unit controls the smart pipette's location, operation speed and force required for operation, etc. of the smart pipette.

However, Fung et al teaches the control of the location of the micro-tip (see section 4, part A).

Fung et al is silent concerning the smart pipette.

Henderson et al teaches the use of the tip of the micro-pipette (micro-tip) to inject into biological cells using micromanipulators (see column 1, lines 18-38).

Henderson et al teaches an improved inertial impact drill having an electromechanical actuator driven by pulses from a driver/amplifier in which the repetition rate, amplitude, and duration of the pulses can be controlled by the operator via the driver/amplifier (see column 4, lines 58-65).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Fung et al with the teachings of Henderson such that a vision unit that acquires visual information of the bio-cell and smart pipette for the addition of the internet-based remote sensing and manipulation system in biological processes like cloning, in-vitro fertilization, genetic research, and in developing methods for treating cancer and genetically caused diseases (see Henderson et al column 1, lines 18-28) and for increased efficiency and safety of manipulation at microscopic levels (see Fung et al Section 3B, 4th paragraph).

Claims 3-4 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoigawa et al (JP 11-347971), Henderson et al (US 6,251,658 B1), and Fung et al (Internet-Based Remote Sensing and Manipulation in Micro Environment, 2001) as applied to claim 1 above, and further in view of Yobas et al (US 2003/0180965 A1).

Claims 3-4 depend on claim 1 such that the reasoning used to reject claim 1 will be used to reject the dependent portions of the claims.

Regarding claim 3, Itoigawa et al does not teach a smart pipette wherein the orientation adjusting unit is suitable for a living body.

However, Itoigawa et al discloses that the micropipette may be made of ingredients other than glass (see paragraph 0051).

Yobas et al teaches a micropipette may be made of PDMS, which is a biocompatible polymer (see paragraph 0068); such the orientation adjusting unit (the manipulator and micropipette) is suitable for a living body.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Yobas et al to eliminate the need to coat the micropipette tip with an elastomer, which was traditionally done to glass micropipettes (see Yobas et al paragraph 0069).

Regarding claim 4, Itoigawa et al does not teach a smart pipette wherein the orientation adjusting unit is a polymer.

However, Itoigawa et al discloses that the micropipette may be made of ingredients other than glass (see paragraph 0051).

Yobas et al teaches a micropipette may be made of PDMS, which is a biocompatible polymer (see paragraph 0068); such the orientation adjusting unit (the manipulator and micropipette) is suitable for a living body.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Yobas et al to eliminate the need to coat the micropipette tip with an elastomer, which was traditionally done to glass micropipettes (see Yobas et al paragraph 0069).

Claim 12 depends on claim 4 such that the reasoning used to reject claim 4 will be used to reject the dependent portions of the claim.

Regarding claim 12, Itoigawa et al does not teach a smart pipette wherein the polymer is polydimethylsiloxane (PDMS).

However, Itoigawa et al discloses that the micropipette may be made of ingredients other than glass (see paragraph 0051).

Yobas et al teaches a micropipette may be made of PDMS, which is a biocompatible polymer (see paragraph 0068); such the orientation adjusting unit (the manipulator and micropipette) is suitable for a living body.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Yobas et al to eliminate the need to coat the micropipette tip with an elastomer, which was traditionally done to glass micropipettes (see Yobas et al paragraph 0069).

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoigawa et al (JP 11-347971), Henderson et al (US 6,251,658 B1), and Fung et al (Internet-

Based Remote Sensing and Manipulation in Micro Environment, 2001) as applied to claim 1 above, and further in view of Fung et al (A 2-D PVDF Force Sensing System for Micro-manipulation and Micro-assembly, 2002).

Claim 10 depends on claim 1 such that the reasoning used to reject claim 1 will be used to reject the dependent portions of the claim.

Regarding claim 10, Itoigawa et al does not teach a smart pipette wherein the sensor unit is a cantilever type.

Fung et al teaches a sensor unit is a cantilever type (see section 1, 2nd paragraph).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Itoigawa et al with the teachings of Fung et al to perform, feedback control for tele-operable micromanipulators and to assist a human operator in exercising manipulation forces below the fracture limit of micro mechanical structures under manipulation (see section 1, 3rd paragraph).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. DeVoe et al (Modeling and Optimal Design of Piezoelectric Cantilever Microactuators, 1997) and Lee et al (US 6,590,139 B1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Natasha Young whose telephone number is 571-270-3163. The examiner can normally be reached on Mon-Thurs 7:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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